

**Patent Claims**

1. Mixture for applying a thin polymeric, corrosion-resistant, electrically conductive or  
5 semiconducting coating which can be shaped in a low-abrasive manner to a substrate, in particular to a metallic substrate such as e.g. a steel sheet, it being possible for the substrate optionally to be precoated e.g. with at least one zinc layer  
10 or/and a zinc-containing alloy layer or/and with at least one pretreatment layer, wherein the mixture comprises A) a content of electrically conductive or/and semiconducting elements/compounds chosen from the group consisting of a) electrically  
15 conductive or/and semiconducting particles having a particle size distribution with a  $d_{80}$  passage value of  $\leq 6 \mu\text{m}$ , measured with a Mastersizer of type S from Malvern Instruments, where, however, not only electrically conductive or/and semiconducting  
20 substances based only on particles of iron phosphide or/and metallic zinc and optionally on up to 5 wt.% of graphite or/and molybdenum sulfide are used, of b) electrically conductive or/and semiconducting polymeric compounds, such as e.g.  
25 polyanilines or derivatives thereof, and of c) electrically conductive or/and semiconducting amine- or/and ammonium-containing compounds, and B) at least one binder, optionally including reactive diluent(s), and C) in each case at least one  
30 crosslinking agent or/and at least one photoinitiator and D) optionally also in each case at least one component chosen from d) post-crosslinking compounds, such as e.g. isocyanates, blocked isocyanates, isocyanurates, melamine resins  
35 or/and derivatives thereof, e) additives, f) corrosion protection pigments, such as e.g. phosphates, phosphosilicates or/and silicates, g) corrosion inhibitors which are not present in

particle form and optionally E) an organic solvent or/and water, the sum of the weight contents of all of the conductive or/and semiconducting elements/compounds A) being 0.5 to 70 wt.% and the content of electrically conductive or/and semiconducting particles a) of these with a particle size distribution with a  $d_{80}$  passage value of  $\leq 6 \mu\text{m}$  being 0 to 60 wt.%, in each case based on the wet lacquer.

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2. Mixture according to claim 1, characterized in that the sum of the weight contents of the water-insoluble or sparingly water-soluble pigmentation a) relative to the sum of the total pigmentation  $\Sigma(a) + f)$  is 30 to 99 wt.%.

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3. Mixture according to claim 1 or 2, characterized in that the mixture of all the types of electrically conductive or/and semiconducting hard particles a) has an average particle size  $d_{50}$  in the range from 0.1 to 4.5  $\mu\text{m}$ , in particular in the range from 0.2 to 3.5  $\mu\text{m}$ .

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4. Mixture according to one of the preceding claims, characterized in that on addition to the mixture, the mixture of all the types of very soft or soft particles which are capable of sliding has a particle size passage value  $d_{80}$  in the range from 1 to 25  $\mu\text{m}$ .

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5. Mixture according to one of the preceding claims, characterized in that on addition to the mixture, the mixture of all the types of very soft or soft particles which are capable of sliding has an average particle size  $d_{50}$  in the range from 0.1 to 20  $\mu\text{m}$ .

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6. Mixture according to one of the preceding claims, characterized in that on addition to the mixture, the metallic particles, including alloy particles, have a particle size passage value  $d_{80}$  in the range from 0.05 to 6  $\mu\text{m}$ .
7. Mixture according to one of the preceding claims, characterized in that on addition to the mixture, the metallic particles, including alloy particles, have an average particle size  $d_{50}$  in the range from 0.01 to 10  $\mu\text{m}$ .
8. Mixture according to one of the preceding claims, characterized in that on addition to the mixture, the corrosion protection particles f) have an average particle size  $d_{50}$  in the range from 0.01 to 5  $\mu\text{m}$ .
9. Mixture according to one of the preceding claims, characterized in that on addition to the mixture, the corrosion protection particles f) have the particle size passage value  $d_{80}$  in the range from 0.03 to 6  $\mu\text{m}$ .
10. Mixture according to one of the preceding claims, characterized in that the electrically conductive or/and semiconducting hard particles a) comprise substances based on compounds or mixture of compounds with or of spinels, such as e.g.  $\text{Fe}_3\text{O}_4$ ,  $\text{Mn}_3\text{O}_4$ ,  $\text{FeMn}_2\text{O}_4$  or/and further substances based on borides, carbides, oxides, phosphates, phosphides, silicates, silicides or particles having an electrically conductive coating or/and a mixture thereof or a common compound thereof, and in that further metallic particles, including alloy particles, graphite or/and carbon black, are optionally present, the metallic particles, including alloy particles, being chosen from

aluminium, iron, cobalt, copper, molybdenum,  
nickel, niobium, silver, tantalum, titanium,  
vanadium, tungsten, zinc, tin, aluminium-, iron-,  
cobalt-, copper-, molybdenum-, nickel-, niobium-,  
5 silver-, tantalum-, titanium-, vanadium-,  
tungsten-, zinc- or/and tin-containing alloys.

11. Mixture according to one of the preceding claims,  
characterized in that at least 10 wt.% of the  
10 electrically conductive or/and semiconducting hard  
particles a) are oxides or/and phosphides  
substantially based on aluminium, iron, cobalt,  
copper, manganese, molybdenum, nickel, niobium,  
tantalum, titanium, vanadium, tungsten, zinc or/and  
15 tin.

12. Mixture according to one of the preceding claims,  
characterized in that the very soft or soft  
particles which are capable of sliding  
20 predominantly or entirely comprise graphite,  
sulfide, selenide or/and telluride, in particular  
graphite, antimony-containing sulfide, tin-  
containing sulfide, molybdenum-containing sulfide  
or/and tungsten-containing sulfide.

25 13. Mixture according to one of the preceding claims,  
characterized in that it comprises at least one  
electrically conductive or/and semiconducting  
polymeric compound b), e.g. at least one conductive  
30 polymer, such as e.g. polyaniline, polypyrrole,  
polythiophene or/and (a) derivative(s) thereof.

14. Mixture according to one of the preceding claims,  
characterized in that it comprises at least one  
35 electrically conductive or/and semiconducting  
compound c), e.g. at least one tertiary amine, one  
ammonium compound or/and (a) derivative(s) thereof.

15. Mixture according to one of the preceding claims, characterized in that it comprises not more than 1.5 wt.% of wax or/and of substances having wax-like properties.
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16. Process for producing a corrosion-resistant, viscoelastic coating comprising polymers and inorganic particles on a substrate, characterized in that a mixture according to one of claims 1
- 10 to 15 is applied to an optionally precoated substrate, optionally dried and at least partly crosslinked, as a result of which a coating of which the average layer thickness in the dry state is not more than 6  $\mu\text{m}$ , measured in the dry state
- 15 microscopically on a ground cross-section, is produced.
17. Process according to claim 16, characterized in that the very soft or soft particles which are
- 20 capable of sliding, such as e.g. graphite, are in each case not ground or are ground with only a low intensity before addition to the mixture or in the mixture or/and in a portion of the mixture.
- 25 18. Process according to claim 16 or 17, characterized in that the electrically conductive or/and semiconducting hard particles a) are ground by themselves.
- 30 19. Process according to one of claims 16 to 18, characterized in that the coating is produced with a mixture in which the mixture of all the types of particles a) has a particle passage value  $d_{90}$  which is no greater than the layer thickness of the dry
- 35 coating produced therewith.
20. Process according to one of claims 16 to 19, characterized in that on grinding of the

electrically conductive or/and semiconducting hard particles a), the over-sized particles are predominantly comminuted, so that a narrower particle size distribution arises.

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21. Process according to one of claims 16 to 20, characterized in that the particle size passage value  $d_{99}$  of the electrically conductive or/and semiconducting hard particles a) is not substantially greater than, no greater than or only slightly less than the average thickness of the coating.

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22. Process according to one of claims 16 to 21, characterized in that the mixture applied to the substrate is dried, stoved, irradiated with free radicals or/and heated in order to form a thoroughly crosslinked, corrosion-resistant, viscoelastic coating.

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23. Process according to one of claims 16 to 22, characterized in that a coating having a thickness of less than 10  $\mu\text{m}$ , in particular less than 8  $\mu\text{m}$ , preferably less than 6  $\mu\text{m}$  and particularly preferably of less than 4  $\mu\text{m}$  is produced.

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24. Process according to one of claims 16 to 23, characterized in that the mixture is free or substantially free from organic lubricants, such as e.g. based on PTFE, silicone or oil, inorganic or/and organic acids or/and heavy metals and other cations, such as arsenic, lead, cadmium, chromium, cobalt, copper or/and nickel.

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25. Process according to one of claims 16 to 24, characterized in that the substrate comprises at least one metal or/and at least one alloy and is optionally precoated, in particular comprises a

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sheet comprising aluminium, an aluminium, iron or magnesium alloy or steel, such as e.g. automobile steels.

- 5    26. Process according to one of claims 16 to 25, characterized in that the mixture according to the invention is applied directly to a pretreatment coating.
- 10   27. Electrically conductive coating comprising polymers and inorganic particles, produced using a mixture according to one of claims 1 to 15 or/and produced using a process according to one of claims 16 to 26.
- 15   28. Use of the coating according to claim 27 as a welding primer, as a protective coating during shaping or/and joining, as corrosion protection of surfaces or in the edge, seam or/and welded seam region, as a repair coating material, as protection
- 20   instead of a hollow cavity seal or/and a seam seal, in particular for vehicle construction or aircraft construction.